PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-137959
(43)Date of publication of application : 26.05.1998

(51)Int.Cl. B23K 26/00
B23K 26/00
B23K 26/06

(21)Application number : 08-332632
(22)Date of filing : 07.11.1996

(71)Applicant : SANEI KIKAI:KK
(72)Inventor : TAKAHASHI YOSHIO

(54) LASER BEAM MACHINE

(57)Abstract:
PROBLEM TO BE SOLVED: To reduce the time loss and the work loss, and to perform the machining with excellent efficiency in the laser beam machining in which the precise machining and the standard cross machining are mixed.
SOLUTION: In a laser beam machine comprising a laser beam oscillator, an objective lens for machining, and the optical system to guide the laser beam to a machining part, machining is performed by switching the machining optical system to the image-forming optical system for the precise machining or the converging optical system for rough machining.

LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The laser removal-processing equipment characterized by to perform high processing of versatility by one set, without changing a troublesome optic with an external signal by changing the optical system for processing to the image-formation mold optical system for precision processings, and the condensing mold optical system for roughing by controllable stage migration in the migration stage which fixed the work, a laser oscillator and the objective lens for processing, and the laser-beam-machining equipment constituted by the optical system which leads a laser beam to the processing section.
[Claim 2] Laser removal-processing equipment constituted so that a perforating process might be performed in image formation mold optical system and the object for cutting processing might be performed in condensing mold optical system in the equipment of range 1 publication of an application-for-patent term.
[Claim 3] Laser removal-processing equipment constituted so that the distance of an objective lens and a work piece might not change with optical-system modification by sharing a processing objective lens between two processing optical system in the equipment of range 1 publication of an application-for-patent term.

[Translation done.]

* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] About the laser-beam-machining equipment which performs removal processing, such as **** and cutting, this invention can be rich in versatility compared with conventional laser-beam-machining equipment, and removal processing with more high productive efficiency can perform it easily.
[0002]
[Description of the Prior Art] In the laser-beam-machining equipment by which the current activity is carried out, the optic inside an oscillator may be adjusted to processings, such as high degree of accuracy which the processing conditions which can usually be changed according to the object are exposure conditions of the focal distance of a processing objective lens, and laser, and cannot cope with it in these range.
[0003] There are many objects with which precision hole processing and a standard crossover are intermingled in laser components processing on the other hand. In order to cope with these, there is also the approach of processing it, while changing processing conditions, but since time human loss is produced, condition modification of those other than a laser radiation condition is processed on condition that precision processing of the whole in many cases.
[0004]
[Problem(s) to be Solved by the Invention] Whole processing in this same condition reduces working speed, and makes consumption of the electrical and electric equipment and gas increase.

[0005] Moreover, it is rare to make a condition change which is accompanied by adjustment of the optic inside an oscillator by the user, and the perforating process of high degree of accuracy etc. is used as a special-purpose machine in many cases.
[0006]
[Means for Solving the Problem] The processing equipment of this invention is equipment which made the change possible for the optical system for processing by controllable stage migration with the external signal at the image formation mold optical system for precision processings, and the condensing mold optical system for roughing in a laser oscillator, the objective lens for processing, and the laser-beam-machining equipment constituted by the optical system which leads a laser beam to the processing section.
[0007]
[Function] By the change of optical system, it changed that modification of the conditions of processing optical system was possible for a short time according to the processing object.
[0008] [Example 1] Next, this invention is explained with reference to an attached drawing. Drawing 1 is drawing having shown the configuration in the case of having arranged this laser-beam-machining equipment to the image formation optical system for precision processings. Incidence is carried out to the reflecting mirror 4 arranged on the direct-acting stage 3, similarly it is reflected by the reflecting mirror 5 on a stage, and the laser beam 2 by which outgoing radiation was carried out from laser oscillation equipment 1 is led to the optical-path modification mirrors 6a and 6b. It is reflected by the optical-path modification mirror 6, and a

laser beam is irradiated by the work 10 through the image formation slit 7, the image formation lens 8, and the processing objective lens 9. The image formation lens 7 and the processing objective lens 9 constitute the image formation optical system of a cutback mold, and are irradiated by the work as a cutback configuration of the image formation slit 7.

[0009] It is a focal distance as an image formation lens 8. 1/50 of cutback scale factors are obtained by using a convex lens with a focal distance of 40mm as 2000mm and a processing objective lens 9. By the pulse oscillation YAG laser of rated output 250w, slit processing with a processing width of face of 0.06mm has processed it into the stainless steel material of 0.4mm thickness with the working speed of 4mm/second at the process tolerance of **0.01mm, using a round shape with a diameter of 3mm as an image formation slit.

[0010] According to the same optical system, the perforating process with an one-side configuration [square] of 0.1mm has processed it in 50 holes / second to the stainless steel material of 0.2mm thickness using the with an one-side square [5mm square] thing as an image formation slit.

[0011] The plot plan at the time of moving the migration plate 11 of the direct-acting stage 3 to drawing 2 by the motor 12, so that a laser beam 2 may carry out incidence to a reflecting mirror 13 is shown. It passes along the beam expander 14 similarly arranged on a stage, and is reflected with a reflecting mirror 15, and convergent radiotherapy of the laser beam is carried out to a work 10 through the processing objective lens 9.

[0012] In this arrangement, although process tolerance falls in order for there to be nothing, the loss of power by the image formation slit, or, efficient processing can be performed. By the pulse oscillation YAG laser of rated output 250w, cutting processing of the stainless steel material of 3mm thickness can be stabilized and carried out. Moreover, to the stainless steel material of 0.4mm thickness, cutting processing is working speed. It was able to do in 30mm /and the process tolerance of **0.05mm a second.

[0013] [Example 2] Drawing 3 shows what used the revolution stage 16 as an optical-path change stage. The change of optical system is performed by rotating a stage 90 degrees.

[0015]

[Effect of the Invention] Thus, by changing processing optical system, the work piece with which a different precision prescribe is intermingled is efficiently processible.

[0014] Still more efficient processing can be performed by including the change of this optical system in the NC code.

[Translation done.]

* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The plot plan at the time of making optical system into the image formation optical system for precision processing.
[Drawing 2] The plot plan at the time of making optical system into the condensing optical system for roughing.
[Drawing 3] Drawing having shown the example of another structure of a change of optical system.
[Description of Notations]
1 ..... Laser oscillator
2 ..... Laser beam
3 ..... Direct-acting stage for an optical-path change
4 ..... Image formation optical-system reflecting mirror
5 ..... Reflecting mirror
6a ..... Image formation optical-system optical-path modification reflecting mirror
6b ..... Image formation optical-system optical-path modification reflecting mirror
7 ..... Image formation slit
8 ..... Image formation lens
9 ..... Processing objective lens
10 ..... Work
11 ..... Stage migration plate
12 ..... Stage drive motor
13 ..... Condensing optical-system reflecting mirror
14 ..... Beam expander
15 ..... Condensing optical-system reflecting mirror
16 ..... Revolution stage for an optical-path change

[Translation done.]

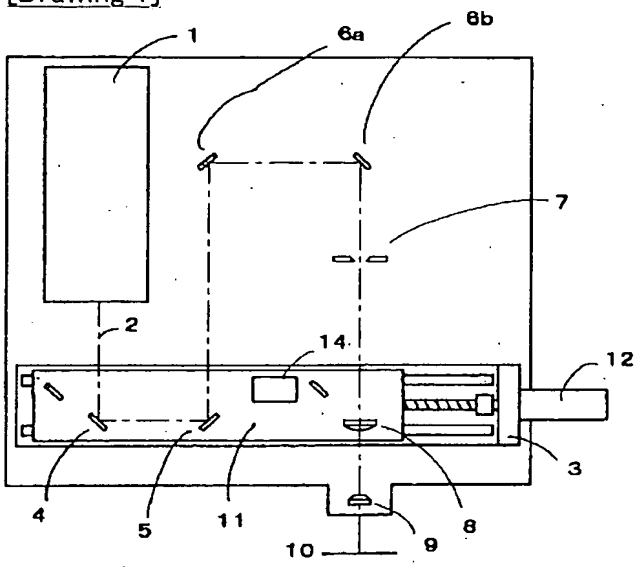
* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

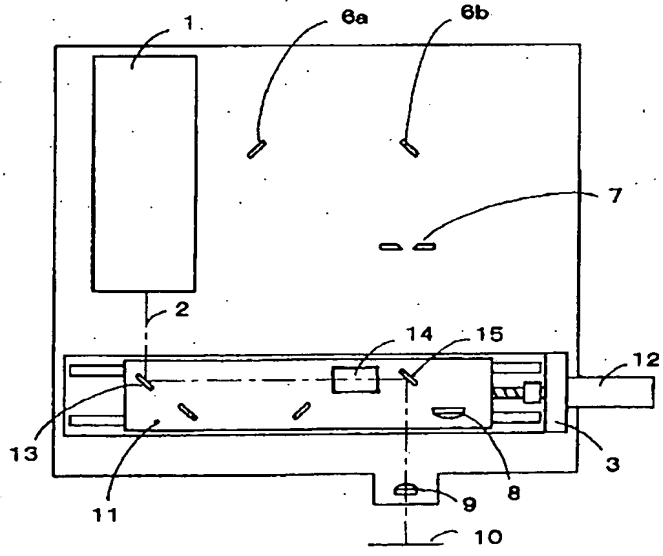
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

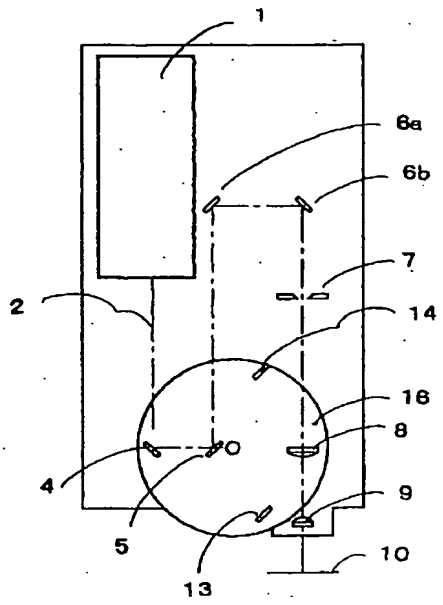
[Drawing 1]



[Drawing 2]



[Drawing 3]



[Translation done.]

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号

特開平10－137959

(43)公開日　平成10年(1998)５月26日

(51)Int.Cl.[6]		識別記号	FI		
Ｂ２３Ｋ	26/00	３３０	Ｂ２３Ｋ	26/00	３３０
		３２０			３２０Ａ
	26/06			26/06	Ｅ

審査請求　未請求　請求項の数３　書面　（全　４　頁）

(21)出願番号　特願平8－332632

(22)出願日　平成８年(1996)11月７日

(71)出願人　596179368
株式会社三栄機械
秋田県本荘市川口字家妻146－３

(72)発明者　高橋　良夫
神奈川県横浜市神奈川区三ツ沢南町18－４

(54)【発明の名称】　レーザ加工装置

(57)【要約】

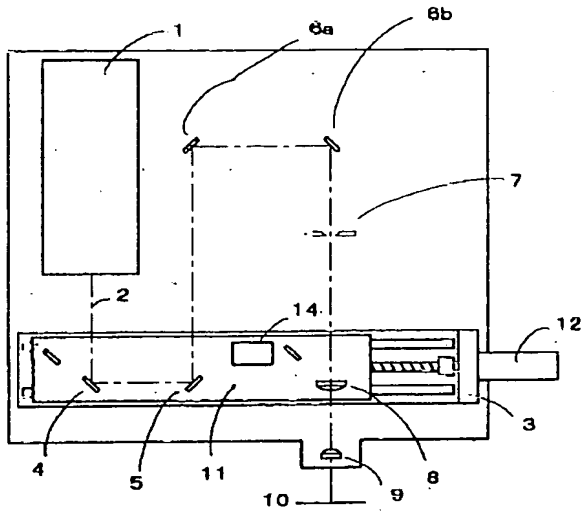
【目　的】　本発明は、精密加工と標準交差加工の混在するようなレーザ加工において、時間的人的損失を減らし、高能率で加工を行なうレーザ加工装置に関するものである。

【構　成】　レーザ発振器、加工用対物レンズならびに、レーザ光を加工部へ導く光学系によって構成されるレーザ加工装置において、外部信号により制御可能なステージ移動により、加工用光学系を精密加工向けの結像型光学系と、粗加工向けの集光型光学系に切り替えを行なって加工する。

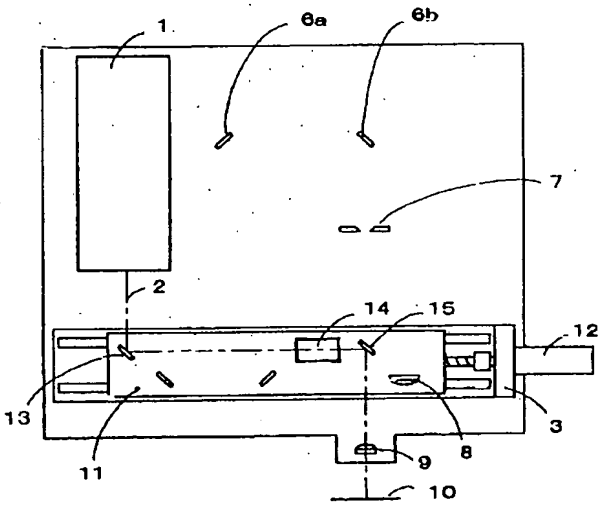
【特許請求の範囲】
【請求項１】加工物を固定した移動ステージと、レーザ発振器、加工用対物レンズならびに、レーザ光を加工部へ導く光学系によって構成されるレーザ加工装置において、外部信号により制御可能なステージ移動により、加工用光学系を精密加工向けの結像型光学系と、粗加工向けの集光型光学系に切り替えることにより、面倒光学部品の変更を行なう事無く、一台で汎用性の高い加工を行なうことを特徴とするレーザ除去加工装置。
【請求項２】特許請求項の範囲１記載の装置において、結像型光学系にて穴開け加工を行い、集光型光学系にて切断加工用を行なうように構成されたレーザ除去加工装置。
【請求項３】特許請求項の範囲１記載の装置において、加工対物レンズを２系統の加工光学系で共有することにより、光学系変更により対物レンズとワークの距離が変化しないように構成されたレーザ除去加工装置。
【発明の詳細な説明】
【０００１】
【産業上の利用分野】本発明は穴開、切断などの除去加工を行なうレーザ加工装置に関するもので、従来のレーザ加工装置に比べ汎用性にとみ、より生産効率の高い除去加工が容易に行なうことが出来る。
【０００２】
【従来の技術】現在使用されているレーザ加工装置において、通常目的に応じて変更出来る加工条件は加工対物レンズの焦点距離とレーザの照射条件であり、これらの範囲で対処出来ない高精度等加工には、発振器内部の光学部品の調整を行なうこともある。
【０００３】一方、レーザ部品加工においては、精密穴加工と標準交差の混在するような物が多い。これらに対処するために、加工条件を変更しながら加工する方法もあるが、レーザ照射条件以外の条件変更は、時間的人的損失を生ずるため、全体を精密加工の条件で加工することが多い。
【０００４】
【発明が解決しようとする課題】この同一条件における全体加工は、加工速度を低下させ電気、ガスの消費を増加させる。
【０００５】また、発振器内部の光学部品の調整をともなうような条件変更が、ユーザで行なわれることは少なく、高精度の穴開け加工等は専用機として使用されることが多い。
【０００６】
【課題を解決するための手段】本発明の加工装置は、レーザ発振器、加工用対物レンズならびに、レーザ光を加工部へ導く光学系によって構成されるレーザ加工装置において、外部信号により制御可能なステージ移動により、加工用光学系を精密加工向けの結像型光学系と、粗加工向けの集光型光学系に切り替えを可能にした装置。
【０００７】
【作用】光学系の切り替えにより、短時間で加工目的に合わせて、加工光学系の条件の変更が可能と成った。
【０００８】〔実施例１〕次に、本発明について添付の図面を参照して説明する。図１は、本レーザ加工装置を精密加工向けの結像光学系に配置した場合の構成を示した図である。レーザ発振装置１から出射されたレーザ光２は、直動ステージ３上に配置された反射鏡４に入射し、同じくステージ上の反射鏡５によって反射され、光路変更鏡６ａ，６ｂに導かれる。光路変更鏡６によって反射されレーザ光は結像スリット７、結像レンズ８、加工対物レンズ９を通って加工物１０に照射される。結像レンズ７と加工対物レンズ９は縮小型の結像光学系を構成しており、結像スリット７の縮小形状として加工物に照射される。
【０００９】結像レンズ８として焦点距離　２０００ｍｍ、加工対物レンズ９として焦点距離４０ｍｍの凸レンズを用いることにより、１／５０の縮小倍率が得られる。定格出力２５０ｗのパルス発振ＹＡＧレーザにより、結像スリットとして直径３ｍｍの円形を用いて０．４ｍｍ厚のステンレス材に、加工幅０．０６ｍｍのスリット加工が加工速度４ｍｍ／秒で、加工精度±０．０１ｍｍで加工出来た。
【００１０】同じ光学系にて、結像スリットとして一辺５ｍｍの正方形のものを使用して０．２ｍｍ厚のステンレス材に対し、一辺０．１ｍｍの正方形形状の穴開け加工が５０穴／秒で加工出来た。
【００１１】図２に直動ステージ３の移動板１１をモータ１２により、レーザ光２が反射鏡１３に入射するように移動させた場合の配置図を示す。レーザ光は同じくステージ上に配置されたビームエキスパンダ１４を通り、反射鏡１５で反射され加工対物レンズ９を通り加工物１０に集光照射される。
【００１２】この配置においては、結像スリットによる出力損失か無いため、加工精度は低下するが、高効率の加工が出来る。定格出力２５０ｗのパルス発振ＹＡＧレーザにより、３ｍｍ厚のステンレス材が安定して切断加工できる。また０．４ｍｍ厚のステンレス材に、切断加工が加工速度　３０ｍｍ／秒、加工精度±０．０５ｍｍで出来た。
【００１３】〔実施例２〕図３は光路切り替えステージとして回転ステージ１６を使用したものを示す。ステージを９０度回転することにより、光学系の切り替えが行なわれる。
【００１５】
【発明の効果】このように加工光学系を切り替えることにより、異なる要求精度が混在するワークを効率良く加工できる。
【００１４】この光学系の切り替えをＮＣコードに組み込むことにより、さらに効率的な加工が行なえる。

【図面の簡単な説明】
【図１】光学系を精密加工用の結像光学系にした場合の配置図。
【図２】光学系を粗加工用の集光光学系にした場合の配置図。
【図３】光学系の切り替えの別構造の例を示した図。
【符号の説明】
１・・・・・・・レーザ発振器
２・・・・・・・レーザ光
３・・・・・・・光路切り替え用直動ステージ
４・・・・・・・結像光学系反射鏡
５・・・・・・・反射鏡
６ａ・・・・・・結像光学系光路変更反射鏡
６ｂ・・・・・・結像光学系光路変更反射鏡
７・・・・・・・結像スリット
８・・・・・・・結像レンズ
９・・・・・・・加工対物レンズ
１０・・・・・・加工物
１１・・・・・・ステージ移動板
１２・・・・・・ステージ駆動モータ
１３・・・・・・集光光学系反射鏡
１４・・・・・・ビームエキスパンダー
１５・・・・・・集光光学系反射鏡
１６・・・・・・光路切り替え用回転ステージ

【図１】



【図２】



【図3】